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SEEDLESS FRUITS.

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If we seek in nature an occurrence which is distinctly prejudicial to the continuance and distribution of species, we find an illustration in seedless fruits. Unless correlated with a development or increase of other means of propagation, as by suckering, off-shoots or bulbs, seedlessness must eventually bring about the destruction of the variety which its advent marks. Hence, seedlessness is more apt to be noted in cultivated or protected plants. In nature we would suppose that seedless fruits would necessarily be confined to the restricted locality wherein they have originated, for it is only under man's care, as it would seem, that they can receive a general distribution, although the habit of a species towards seedlessness may cause similar variety originations in different localities. Hence it is with extreme surprise that we note the wide extension of *Acorus Calamus*, a plant that so rarely perfects its fruit that this has been seen by but few botanists.¹ Yet sterility is but the extreme of the partial sterility, or more or less fruitfulness, which is so constantly noted, and we cannot consider the causes of one without more or less considering the causes of the other.

The causes of sterility, either partial or complete, must be many and complicated. The various factors combined under the term season are an influential series, as we note the increased fruitfulness of various wild fruits in one season as against another;

¹ Darwin, An. and Pl. ii. 207.

as for illustration, the dangle-berry, (*Gaylussaccia frondosa*) in a Massachusetts locality, bore little fruit in 1888, the bloom failing to form, while in 1889, in the same locality the shrubs were extremely prolific. We find excellent illustration of the effect of climate in Humboldt's statement that on the slopes of the mountains of Mexico and Xalapa, at 677 toises of height, the luxuriance of vegetation is such that wheat does not form ears; and in India, Firminger notes quite a large number of plants that rarely blossom or seed, such as *Convolvulus tricolor*, *Geum atrosanguineum*, *Hibiscus Rosa-Sinensis*, *H. liliiflorus*, etc. Brandis in his Forest Flora names also the *Populus alba*, *Bambusa Balcova*, etc., and Seemann in the Feejee Islands the *Dioscorea alata*. Such instances could be almost indefinitely extended. A correlation between tuber bearing and seeding also seems to exist. Thus the *Agave vivipara*, when grown in rich soil in India invariably produces bulbs, but no seed, while on a poor soil and under arid conditions the opposite result occurs.¹ The sweet potato in China, according to Dr. Fortune,² never yields seed; in our region the sweet potato never blossoms, or if at all very rarely, yet in Alabama it blossoms, but, as Dr. Newman writes me, when forwarding the bloom, that he had never known seeds to be formed. The potato was noted by Knight³ as having varieties that do not bloom, and at the present time the majority of our cultivated varieties, while blooming freely, yield no fruit or seed. The sugar cane rarely seeds, and Darwin quotes testimony that it never seeds in the West Indies, Malaga, India, Cochin China or the Malay Archipelago, yet recently at Barbadoes sugar cane has seeded and the seed has yielded seedlings⁴. A most interesting case of barrenness has come under my own observation at Nonquit, Massachusetts, where a gold-striped form of *Spartina cynosuroides* has been sterile for two years, while the ordinary green form alongside has seeded abundantly. Hybridity may also be ascribed as a cause, and Darwin cites a number of instances, and quotes Kolreuter as expressing astonishment that

¹ Royle. Trans. Linn. Soc. xvii. 563.

² Darwin An. and Pl. ii. 206.

³ Hort. and Phys. papers, 321. Goodrich, Trans. N. Y. Ag. Soc. 1847, 447.

⁴ Agricultural Science, March, 1889, p. 58.

hybrids are not only frequently sterile, but show a strong tendency to develop gigantic or tuberous roots, and as almost invariably tending to increase largely by suckers. We must not, however, ignore those obscure observations wherein we note an influence of pollen in developing the ovarium, although incapable of developing the ovule, and Darwin's statement that "with an orchid, the *Bonatia speciosa*, the development of the ovaria could be effected by mechanical irritation of the stigma" has not received the attention from investigators that its importance deserves. Gærtner often insists, says Darwin, that the flowers of utterly sterile hybrids, which do not produce any seed, generally yield perfect capsules or fruit, a fact which Naudin has repeatedly observed in the Cucurbitaceæ. It seems to be well ascertained that certain plants can produce not only fruit, but fertile seed, without having been subjected to the action of pollen. Thus, as good authorities as Quatrefages¹, says this is unquestionably true, and Hooker² quotes facts of this character from Spallanzani, Bernhardt, Ch. Naudin, Fresenius and Tenore, and Jussieu³ and Darwin⁴ express also their belief. Treviranus⁵, however, states that a perfect development of fruits, but with barren seeds will take place with some plants without the process of fertilization.

There seems to exist in fruits a correlation between seedlessness and quality, especially when that quality is expressed by the term tenderness of tissue. In fruits of a fine quality, tenderness of the seed coating often seems a marked characteristic, as in grapes, where the seeds of the improved varieties are distinctly softer and more brittle than in those of the wild species; as in peaches and plums, where the tendency of a split stone is often noticeable in fruit of varieties of high quality. It certainly should not be overlooked that universal experience usually recognizes lack of hardness in trees of the most highly improved and developed varieties. This idea of correlation between seedlessness and quality is by no means a new one. Thus Bacon⁶ wrote,

¹ Quatrefages, *Metamorphoses of Man*. 271.

² Hooker, *Journ. of Bot.* ix. 53.

³ Jussieu, *Cours element. de Bot.* 1840, 463.

⁴ Darwin, *An. and Pl.* i. 484.

⁵ *Lond. Hort. Soc. Trans.* 1854, 112.

⁶ Bacon's *Works*, Bohn. Ed. i. 142.

(born 1651): "The making of fruits without core or stone is likewise a curiosity, and somewhat better, because whatsoever maketh them so, is like to make them more tender and delicate." With such authority is it surprising that the "Christian Advocate,"¹ properly a disciple of humanism or idealism rather than of realism, soberly says: "Fruit of all kinds may be grown without seed by reversing the cion—rooting the top end of the cion. *

* * Apples are grown without cores, peaches without seed, and grapes, plums, cherries, blackberries and every other kind of fruit may be grown without seed by simply reversing the cion. Persimmons without seed are not to be excelled by any other fruit in this country when dried. Apples cooked without cores are delightful. Grapes have been raised for five thousand years without seed. Peaches dried whole without seed would be a hundred times better than those shaved up and dried. The seeding of cherries has been a great trouble to cooks." !!

The taking the pith from the vine in order to produce seedlessness, received the approval, if not the trial, of the ancients, as we find directions from Democritus, Palladius, Columella, and the well-read Bacon².

In the present stage of this investigation, I prefer to give such facts and statements regarding seedlessness, mostly in fruit, used in the horticultural sense, that have come to my attention, allowing the facts to speak for themselves. If such a correlation between quality and seedlessness exists, as I infer, this presentation has a value in calling attention to a possible method whereby our cultivated fruits may be more improved, and wild fruits be more successfully brought into cultural use.

It may be proper to call attention in advance to the fact that as regards size of fruit, there seems to be no way of generalizing at present. In the bunches of our cultivated grapes the larger berries contain usually the most seed; in the banana, increase of size apparently accompanies seeding, and the opposite conclusion is stated by Balfour also in relation to the breadfruit as well as the banana.³

¹ Quoted in the New York Analyst, Sept. 1, 1885.

² Democritus, Geopon. lib. 4, c. 7. Palladius, De re rust. Feb. c. 29. Columella, De arb. c. 9. Bacon, notes, 1, c.

³ Balfour, Bot. 261.

APPLE. *PYRUS MALUS*, L. (ROSACEÆ).

The apple is a fleshy fruit consisting of the ovary and calyx. The outer skin or epicarp is composed of the epidermis of the calyx combined with the ovary; the fleshy portion is the mesocarp, formed by the cellular portion of the calyx and ovary; while the scaly layer forming the walls of the seed-bearing cavities in the centre, is the endocarp. The carpels lie towards the centre of the fruit and form the core, while the edible pulp is formed by the calyx, which is adherent to the exterior of the ovary.

The better varieties of the apple usually contain some abortive seeds, and are sometimes individually to be found seedless. As a rule, where there is a tendency to abortive seeds, the larger and finer the apple the greater the number of abortive seeds. Thus five Baldwin apples, weighing thirty ounces, had eleven plump and nine shrivelled seeds; five others from the same barrel, and weighing seventeen ounces, furnished twenty-five plump and three abortive seeds.

The ancients were acquainted with the fruits of but limited areas as compared with our knowledge of to-day, for transportation and travel were then difficult. However, a goodly number of varieties are named. Pliny¹ gives the names of seventeen kinds as known to the Romans. In the sixteenth century Cordus² describes thirty-four German sorts; Le Jardinier Solitaire, 1612, describes ten French varieties; Parkinson, in his *Paradisus*, 1629, names or briefly describes fifty-seven sorts; J. Bauhin, in 1650, figures fifty-nine varieties and describes seventy-four; Rea, in his *Flora* of 1665, describes twenty sorts; Ray, in his *History*, 1688, names seventy-eight; Quintyne, in the English edition of his *Compleat Gardener*, 1693, catalogues twenty-five; Zwingerus, in 1696, in his *Kreuterbuch* gives a list of two hundred and thirty-four apples; Langley's *Pomona*, 1729, describes thirty-nine; Miller's *Dictionary*, 1731, commends forty kinds; Knoop's *Pomologia*, 1760-'66, gives colored figures of two hundred and fifteen; Mawe's *Gardiner*, 1778, enumerates sixty-seven varieties; Don, in 1832, offers a list of one thousand three hundred and ninety-six distinct apples; Downing, in 1866, notices six hun-

¹ Pliny, lib. xv. c. 15.

² J. Bauh. Hist. 1650, i. p. 5.

hred and forty-three kinds; and the American Pomological Society in 1877, approves for culture three hundred and twenty-two apples and thirteen crabs.

Seedless apples were known to the ancient Greeks¹, and the Romans,² called such the *spadonium* of the Belgae. In the twelfth century, Ibn-al-awam³, a Moorish-Spaniard, cites Abou'l-Khari, of Seville, who describes the *Schahaly* apple as producing no flowers, and the fruit containing no seed. Camerarius⁴, in 1588, mentions apples without seed, but also quotes Throphrastus; Bauhin,⁵ in 1623, quotes Camerarius, and the apple not flowering, yet fruit-bearing of Gesner, which doubtless was seedless. Parkinson,⁶ in 1629, speaks of the "apple without bloom" neither a good eating nor baking fruit, and in 1640⁷, speaks of the *Poma nana*, the same name Camerarius uses, as having no kernels within the core. In 1650 we have Gesner and Camerarius quoted by John Bauhin, the former describing his tree in the vicinity of Tiguri, the latter as *Poma nana*, and a wood-cut of the *Malus non florida dicta*, which he states is wont to be seedless.⁸ This same figure, not accurately copied, is given by Jonston⁹ in 1662, who apparently had not seen the variety, and a better copy by Chabraeus¹⁰ who claims to have seen the fruit in the garden under charge of J. Bauhin; he calls it *Malus non florida dicta*, Gall. *Pommier sans fleur*. In 1665 the Hort. Reg. Paris, as quoted by Miller¹¹ had the *Malus fructifera, flore fugaci*, or fig apple. He had not seen a specimen himself, but refers to a letter written from New England by Paul Dudley, and published in the Phil. Trans. No. 385, as being of this kind. This letter¹² says, "This tree was no graft, and the fruit but ordinary

1 Theoph. de caus. pi. lib. 3 c. 23.

2 Pliny, lib. xv. c. 15.

3 Le livre de l'Agric. d' Ibn-al-awam. Trad. par J. J. Clement Mullett, Paris, 1864, i. 308.

4 Cam. Hort. 1588, 95.

5 Bauh. pin. 1623, 433.

6 Park. par. 1629, 588.

7 Park. theat. 1640, 1502.

8 J. Bauh. Hist. 1650. i. 22.

9 Jonston, dend. 1662, p. 2, t. 2.

10 Chatraeus, stirp. sciag. 1677, p. 1; also ed. of 1666, p. 1.

11 Miller, Gard. Dict, 1731, art. malus.

12 Phil. Trans. 1724, 200.

for taste." In 1719 Tournefort¹ makes like reference to the Paris Garden, and gives as synonyms the *Malus non florida dicta* of J. Bauhin, and the common name *Pomme figue*. In 1768 Duhamel² describes the same variety, and in his second edition gives a figure of the fruit. In 1834 there was exhibited at the Massachusetts Horticultural Society's exhibition,³ from Shrewsbury, Massachusetts, "A curious apple produced without blossoms, and having neither core nor seed." October 13, 1888, some "No Blow" apples were brought to the society by Mr. L. C. Durkie, of Northfields Farms, and these were identical in shape, but a little redder in color, than Duhamel's figure. I secured good colored drawings and dissections, and found them double-cored and seedless. The taste acid, crisp, sprightly, reminding of the Porter apple. December 15, 1888, O. B. Hadwin, of Worcester, informed me that the Shrewsbury seedless apple was well-known to him, and was the same variety as the "No Blow."

In 1778 Mawe⁴ describes the Fig apple, and accounts for the name by the trees producing fruit without any visible flowers, like the Fig, but he adds that the tree does produce flowers that are visible, but almost apetalous. The *Pomme figue* is described, with Bauhin's and Tournefort's names as synonyms by Poiret⁵ in 1804, and under the names *Pomme figure sans pepin* and *Pomme d'Adam* by Noisette⁶ in 1829, who describes it as yellow striped with pale red, with firm and acid flesh. This fruit is also referred to by Ray,⁷ in 1688, who but quotes from Bauhin's Pinax, and apparently by Joncquit, in 1659, under the name *Malus fructifera sine flore d'Robin*.

From this review it seems placed among the strong probabilities that many of these seedless apples were one and the same variety which has been continued through the years, and if so, illustrates either that it occasionally produces seed which continues the variety, or else that the present trees have been continued from grafts for over two thousand years.

1 Inst. rei herb. 1719, 635.

2 Duhamel du Monceau, arb. fruit, 1768, i. 318; 2d ed. i. pl. 28.

3 Hist. Mass. Hort. Soc. p. 234. Mass. Hort. Soc. Rept. 1834, 22.

4 Mawe and Abercrombie, Gardener, under *Pyrus*.

5 Enc. method. bot. v. 562.

6 Noisette, Man. du Jard. 1829, 437.

7 Ray, Hist. 1688, ii. 1446.

Other remarks on seedless apples are those of Darwin,¹ who speaks of the curious St. Valery apple, in France, which although it bears fruit, rarely produces seed; that of the Bon Jardinier², which describes the *Sans Trognon de Menocher*, an excellent winter apple of the valley of Digomier, of which is said: "We do not know of a finer apple; it is well named coreless, for it has nothing within the skin which resembles a core, neither seed nor seed cells; it is excellent, of large medium size!"

As to causes, the apple becomes seedless in Jamaica according to Lunan,³ apparently the effect of climate. In Knight's⁴ experiment of grafting the apple on the pear, the fruit was seedless. In 1882 some Carolina Red Sour apple trees bore a second crop in Georgia, and these were seedless; "There was not the least evidence that any embryo had ever been present in the core or cavities of the endocarp."⁵

In a case reported in France⁶ of a seedling apple one-half of which was red and acid, the other half green and sweet, suggesting hybridization, there was said to be scarcely ever a perfectly developed seed.

In counting the seed of a number of variety of apples, the following figures were obtained.⁷

<i>Variety.</i>	<i>No. of Specimens.</i>	<i>Average No. of Plump Seed.</i>	<i>Average No. Total Seed.</i>
Baldwin,	67	3.73	5.74
Bellefleur,	5	9.5	11.5
" Yellow,	2	8	8
Blue Pearmain	3	12	12.66
Greening,	1	4	7
" naked limb	1	10	10
" Palmer	1	3	3
" Rhode Island	6	6.87	11.21
" Winthrop	1	6	7
Gilliflower,	3	5	7
Grimes' Golden,	1	10	10

¹ Darwin, An. and Pl. ii. 203. See also Bailey, The Bloomless Apple, Am. Garden, Jan. 1890, 6.

² Bon Jardinier, 1882, p. xlvii.

³ Lunan. Hort. Jam. p. 24.

⁴ Phys. and Hort. Papers, 222.

⁵ Country Gentleman, Nov. 30, 1882.

⁶ Loudon's Gard. Mag. xiii. 230.

⁷ N. Y. Ag. Ex. Sta. Rept. 1882, 82; Proc. Soc. for P. of Ag. Sc. 1881, 114.

<i>Variety.</i>	<i>No. of Specimens.</i>	<i>Average No. of Plump Seed.</i>	<i>Average No. Total Seed.</i>
Hubbardson,	4	3.75	6.33
Hyde,	2	8.5	8.5
Jelly,	1	8	8
King of Tompkins County,	3	7.6	8.6
Lady Apple,	2	7	7
Northern Spy,	4	12.75	13.75
Pippin, Golden	2	4	7
“ Monmouth	1	8	8
“ Newtown	1	1	10
“ New York	1	10	10
Russet,	1	6	8
“ English	1	9	9
“ Golden	3	3	7
“ Gray	1	1	6
“ Roxbury	4	3.25	8.66
Seek no Further, Westfield	1	16	18
Smith's Cider,	1	9	9
Spitzenburg,	3	6	7.6
“ Esopus	6	10.7	11.1
Swaar,	1	13	13
Tolman Sweeting,	8	7.7	8.7
Vandevere,	1	9	10
Willow Twig,	1	10	11
Winter Blush, Tewksbury,	1	6	6

AVOCADO PEAR. *PERSEA GRATISSIMA*, GÆRTN. (LAURACEÆ).

There are several species or varieties of this fruit. Morelet¹ describes them in Central America; the *avocate*, the *omtchon*, and a third called *anison* on account of its flavor. In the normal plant the fruit is of the size of a large pear, and contains a large oval stone, which rattles when the fruit is ripe; the pulp is of a delicate coffee color, unctuous, without odor, resembling fresh butter. Long² mentions a green and a red sort in Jamaica.

In Ceylon the fruit is said to be smaller, harder, less buttery, thicker skinned and more stony than in other climes.³

I introduce this statement among seedless fruit on account of the decrease of quality accompanying the *stony* seed, whatever that may mean.

¹ Travels, p. 265.

² Jamaica, p. 808.

³ H. L. C. Gard. Chron. Apr. 19, 1884, p. 520.

AZAROLE. CRATÆGUS AZAROLUS, L. (ROSACEÆ).

This fruit is usually two-seeded, and when fully ripe is said to have an agreeable taste. It is esteemed in Italy and the Levant, where it is served at dessert. It is said to be much cultivated¹. The fruit is cherry size, and is a pome resembling a very small pear. Duhamel,² says there are numerous varieties, the small yellow fruited, the small red fruited, and the large deep red fruiting. Noisette³ mentions as varieties the fruit *longes*, *rouges* and *jaunes*.

Athenaeus⁴, a Greek author of the second and third century, speaks of the Azarole as sweet and seedless. Darwin⁵ mentions this plant amongst those in which the best varieties bear none or few seed.

BANANA. MUSA, SP. (MUSACEÆ).

The banana is a prominent instance of a seedless fruit. The fruit is composed of three adherent carpels surrounded by the external coat of the ovarium. There are very many varieties. Rumphius⁶ says there are as many different kinds as there are of apples and pears in Europe. There are no fewer than thirty varieties cultivated by the natives of Tahiti, according to Ellis⁷, besides twenty kinds, very large and serviceable that grow wild in the mountains. In Feejee, Wilkes⁸ mentions five or six kinds besides the wild form, as cultivated. In India, Mueller⁹ says about fifty distinct kinds are grown, and Firminger¹⁰ enumerates twenty-one sorts under five species. Carey¹¹, however, says the cultivated varieties are infinite. Simmonds¹² estimates twenty varieties in Tenasserim, ten in Ceylon and thirty in Burmah.

1 Bot. Reposit. ix. pl. 579.

2 Duhamel du Monceau, arb. fruit, 1768, i. 325, fig. p. 334.

3 Man. du Jard. 1829, 444.

4 Sprengel. Hist. Rei Herb. i. 25.

5 Darwin, An. and Pl. ii. 208.

6 Rumph. Amb. v. p. 126, t. 60.

7 Polynesian Researches, i. 372.

8 U. S. Ex. Exp. iii. 333.

9 Mueller, Sel. Pl. 136.

10 Gard. in India.

11 Hort. Bengal. 18.

12 Trop. Agr. 457.

Forster¹ does not attempt to enumerate, but says the plantain varies almost *ad infinitum* like an apple. A few more quotations will suffice. Heuze² says the banana has produced fourteen varieties in Malabar, twenty-nine in Tahiti, fifteen in Tonga, sixteen in Malaysia and eighty in Batavia. On the Amazon, Castelnau³ notes an enormous number of varieties, and Grant⁴ mentions very distinct kinds in Central Africa.

This very abundance of varieties shows that the fruit must occasionally produce seed, and such instances are recorded. On the coast of Paria, near the Golfo Triste, Humboldt⁵ says the banana is said to occasionally produce germinating seeds if the fruit be allowed to ripen on the stem. At Bordones, also, near Cumana, perfectly formed and matured seeds have been occasionally found in this fruit. Other examples of seeding are given as we proceed.

Musa ensete, Gmelin, is cultivated⁶ in Abyssinia in large plantations for the inner portion of the stem and the young spike, which is used as a staple vegetable. Its fruit is dry and inedible, containing a few large stony seeds.⁷ There are many instances given of other banana fruit containing seed. Burton⁸, in Central Africa says the best bananas are grown by the Arabs at Unyamembe, but poor specimens, coarse and insipid, stringy and full of seed; upon Lake Tanganyika there is a variety called *Mikono t'humbo*, or elephant's hands, very large, the skin brick-dust red, the pulp a dull yellow, with black seeds, and the flavor harsh, strong and drug-like. On the Coromandel Coast, Roxburgh⁹ found both bananas and plantains under culture, and says the original wild *Musa* from which all the cultivated varieties of both plantain and banana proceed, bears numerous seeds. In the Himalayas, Hooker¹⁰ notes two species of wild plantain, which ripen austere and small fruits which are full of seeds, and quite

1 Forster, Obs. 177.

2 Les. pl. alim. ii. 569.

3 Quoted by Herndon, Amazon, 181.

4 Speke's Nile, 583.

5 Views of Nature, 305.

6 Bruce, Voy. v., 50, t. 8 and 9.

7 Masters Treas of Bot. art. *Musa*.

8 Burton, Lake Region of Central Africa, 316.

9 Roxburgh, Coromandel Pl. iii. 74.

10 Hooker, Himalayan Journal, i. 143.

uneatable. At Manilla, Meyen¹ states that there is a variety of banana full of seeds. At Luzon, he says² there is a permanent variety, *Platano de Pepita*, propagated by shoots, and though it contains a great number of seeds, the pulpy substance of the fruit is exceedingly well flavored. In India, Cochin China and Java, this variety is also found, the fruit full of seeds, and therefore, less esteemed for eating. Finlayson³ expressly mentions the cultivated *Musa* with perfect seeds, and on the island of Ubi he found a wild *Musa* with fruit full of seeds, and little edible pulp. At Batavia in 1790, Captain Cook⁴ found the variety called *Pissang Batu* or *Pissang Bidjie* to be full of seed, but he adds that it had no excellence to recommend it to the taste, but the Malays use it as a remedy for the flux. At New Holland⁵ he speaks of a variety of wild plaintain with seeds and well tasted, although on a previous page he says plantains are not found there. At another page he says these wild plantains were so full of stones as to be scarcely eatable.

Among the more definite mentions of seedy bananas, we may note *Musa glauca*, Roxb.,⁶ native of Pegu, the fruit containing little else but seed, and scarcely fit for a monkey to eat. Royle⁷ records *Musa Nepalensis* as apparently wild in Nepal, the fruit containing little else than the hard dry seeds. Loureiro⁸ in Cochin China describes *Musa semenifera* in three varieties, one with seeds and scarcely any pulp, another with many seeds and a sweet pulp, the third which rarely seeds and the pulp very sweet. Roxburgh on the Coromandel Coast describes *Musa superba* as ripening seed, the fruit of no use, and *Musa troglodytarum* is described in Miller's Dictionary as having numerous seeds and inedible fruit. The same is said of its synonym *Musa uranoscopus* by Loureiro. On the contrary Mueller⁹ says the edible fruits

1 Quoted by Darwin, An. and Pl. ii. 205, note.

2 Meyen, Outlines of the Geog. of Pl. London, 1846, p. 326.

3 Jour. of Voy. to Siam, 1826, p. 86.

4 Cook, Voy. i. 304.

5 Cook, Voy. i. 234, 235.

6 Roxburgh, Coromandel Pl. Plate 300.

7 Royle, Ill. of Bot. of the Himalayas, 355.

8 Loureiro, Cochin Ch. 644.

9 Mueller, Select Plants, under *Musa*, p. 136.

are small, reddish or orange colored, upright and edible, and by the context seedless; and at the Edinburgh Botanical Garden¹, *Musa superba* furnished a great quantity of high flavored, and from the context, seedless fruits.

Musa rubra, the *Vai* of Cook, and *Fahie* of Wilkes, grows both wild and cultivated at Tahiti. Wilkes² says it is destitute of seed, and praises the fruit very highly. Another authority³ says there are five varieties, and still another⁴ states that there are twenty sorts, found wild. Mueller l. c. seems to consider this species as synonymous with *Musa troglodytarum*.

The cultivated bananas and plantains have been assigned to quite a number of species, and furnish almost innumerable varieties, all of which are normally seedless, and all of which are described as more or less delicious for those kinds which are eaten raw.

BARBERRY. BERBERIS VULGARIS, L. (BERBERIDEÆ).

The fruit hangs in pendulous racemes, the berry a one-celled ovary containing from one to eight seeds. The culture is scarcely of sufficient importance to justify expectation of varieties, yet Duhamel⁵ mentions the common red, the seedless, the purple, the white, the broad-leaved, the box-leaved, etc., and the black fruited of Tournefort, from the banks of the Euphrates, which, is said to be of a delicious flavor. The purple-leaved in ornamental gardening, is familiar to us all.

The first mention of a seedless barberry that we find is by Gerarde⁶, in 1597. The second edition of his works in 1636, also speaks of it in the same words. "We have likewise another without any stone; the fruit is like the rest of the barberries, both in substance and taste." In 1601, Clusius⁷ had seen this kind at a village near Frankfort, and he pronounces it by far the best sort for preserves. It is mentioned by name by Bauhin⁸, in

¹ Bot. Mag. quoted Gard. Chron. 1841, Mar. 20, p. 182.

² U. S. Exp. Exp. ii. 28, iii. 333.

³ Voy. of the Novara, iii. 243.

⁴ Ellis, Polynesian Researches, i. 372.

⁵ Duhamel du Monceau, arb. fruit, 1768, i. 151.

⁶ Herbal. 1579, p. 1144; 1636, p. 1325.

⁷ Clus. rar. plant, 1601, i. 121.

⁸ Bauhin, pin. 1623, p. 454.

1623, and shortly by Parkinson,¹ in 1629 and 1640, who evidently had never seen it, and also is recorded by Coles,² in 1657, by name, by Jonston³ in 1662 by name, by Ray,⁴ in 1688, Tournefort,⁵ in 1719, and Miller,⁶ in 1731. In 1750, an anonymous French work on gardening⁷ describes it as being the most desirable sort, and Duhamel,⁸ in 1755, says it is subject to occasional seeding; in 1768 he⁹ says it is the variety most deserving of culture. Mawe,¹⁰ in 1778, just mentions it by name, and it is noted by Willdenow,¹¹ in 1799, by Poiret,¹² in 1808, Noisette,¹³ in 1829, and is described apparently from Duhamel by Downing¹⁴ in recent times. I have found occasionally seedless fruits on hedge plants in Maine.

It would seem that this stoneless fruit has been unknown in England and America, or at least not recorded, but has been grown in Germany, and we find it stated by several authors that it is especially valued about Rouen, in France, for the making of preserves.

BEECH NUTS. *FAGUS FERRUGINEA*, AIT. (CUPULIFERÆ).

The beech nut is usually abortive in South Framingham, Massachusetts, while the empty shells are in some seasons abundant, yet I have never seen there perfect seed. In other localities, the nuts usually appear plump and well filled.

BREADFRUIT. *ARTOCARPUS INCISA*, L. (URTICACEÆ).

The edible portion is formed by the cohesion into a single mass of the floral envelopes and ovaria of a large number of

1 Parkinson, parad. 1629, p. 561, theat. 1640, p. 1559.

2 Coles, Adam in Eden, 1657, p. 273.

3 Jonston, dendrog. 1662, p. 220.

4 Ray, Hist. 1688, ii. p. 1605.

5 Tournefort, Inst. 1719, p. 614.

6 Miller's Dict. 1731, under *Berberis*.

7 Les agrements de la Campagne, 1750, 159.

8 Duhamel du Monceau, Traite, 1755, i. p. 98.

9 Duhamel du Monceau, arb. fruit, 1768, ii. 151.

10 Mawe., Gard. 1778, under *Berberis*.

11 Willdenow, sp. pl. 1799, ii. p. 228.

12 Poiret, Enc. Meth. Bot. viii. p. 616.

13 Noisette, Man. du Jard. 1829, p. 448.

14 Downing, Fruits, 1866, p. 244.

flowers, arranged on a central fleshy column or spike. Rumphius¹ reports the tree wild in Banda. At Tahiti² they reckon no less than thirty varieties. In the Samoan group, Wilkes³ says there are twenty varieties, and in the Feejee Islands nine different kinds distinguished by fruit of different sizes and shapes, and the figure of the leaves. Peschal⁴ says that twenty-seven trees, which would about cover an English acre with their shade, are sufficient for the support, during the eight months of fruit-bearing of from ten to twelve people.

The earliest record of the breadfruit is by the writer of the account of Mendana's⁵ voyage to the Marquesas Islands in 1595. It was again noted by Dampier,⁶ in 1688, who in his description says there is neither seed nor stone in the inside. Seeding forms are, however, described by Sonnerat,⁷ and by Rumphius,⁸ the latter figuring the *Soccus granosus*, which contains seed, and the *Soccus lanosus*, whose cavity contained no seed except in one variety which contained a few seed. Forster,⁹ 1786, makes two varieties, one seedless, the other seed-bearing. Of the first, he notes five different kinds, and of the second he remarks that on account of the superiority of the seedless kind, it has become neglected. Thunberg,¹⁰ in 1779, says the fruit, the size of a child's head, sometimes has abortive seeds and sometimes none. Meyen¹¹ says the fruit generally contains seeds, and that by culture a number of seedless varieties have been formed. The seeds are said by Wilkes¹² to be often abortive in Tahiti. This tree came to Jamaica in February, 1793, and in 1814, Lunan¹³ says that the varieties in Jamaica, save one, are seedless, and this ex-

1 Rumph. amb. i, p. 113, pl. 33.

2 Enc. Brit. xviii. 280.

3 U. S. Ex. Exped. ii. 121; iii. 333.

4 Races of Man. 156.

5 Enc. Brit. xviii. 281.

6 Dampier, Voy. i. c. 10.

7 Sonnerat, Voy. 99, t. 57-60.

8 Rumphius, amb. i, 110, t. 32.

9 Forster, Pl. esc. 1786, p. 23. See also obs, p. 179.

10 Thunberg, Phil. Trans. 1779, vol. 69, p. 465.

11 Meyen, Outlines of Geog. of Pl. 1846, pp. 322, 323.

12 U. S. Ex. Exped. ii. 50.

13 Lunan. Hort. Jam. 1814, i. 113.

ception has but a small number, and is not good unless baked. He says in Otaheite they reckon eight varieties without seed, and one with seed, but it is inferior to the others. Wallace² says that the seeds are entirely abortive by cultivation; he praises the taste and compares it to Yorkshire pudding; a friend said it was like mashed potatoes and milk. "It is generally about the size of a melon, a little fibrous towards the centre, but everywhere else quite smooth and puddingy, something in consistence between yeast dumplings and batter pudding. It is in no way as good as simply baked. With meat and gravy, it is a vegetable superior to any I know." The seed-bearing variety, he continues, is common all over the tropics, and though the seeds are very good eating, resembling chestnuts, the fruit is quite worthless as a vegetable.

CABBAGE. *BRASSICA OLERACEA*, L. (CRUCIFERÆ).

Although not a fruit, yet it is interesting to note the relation of the seed to the recognized quality. Thus arranging the races in the order of delicacy, we have the following table:

	<i>No. of Var. or Trials.</i>	<i>Wt. of 100 Seed in grains.</i>
Cauliflower,	24	4.55
Broccoli	4	5.03
Brussels Sprouts,	2	4.06
Cabbage, Savoy	8	5.08
" White	38	5.62
" Red	4	6.17

CHAMÆROPS STAURACANTHA. (PALMÆ).

This tree has the character of producing sterile fruit, but mixed with fertile on the same panicle. The pulp of the fruit is of a peculiar delicate, spongy consistence and of a pure white and shining on the outside. The fruit is oblong, about one inch in longest diameter. It has probably, says Prestoe,¹ been brought under a certain amount of cultivation from very remote times.

² Wallace, Malay Archipelago, p. 310.

¹ Prestoe, Rept. Trinidad Bot. Gard. 1880, p. 39.

CHERRY. *CERASUS VULGARIS*, MILL. (ROSACEÆ).

The cherry fruit is formed by a change in the substance of the carpellary leaf. The internal surface of this becomes hardened into the stone or endocarp, whilst the external surface or epicarp remains as a thin cuticle or skin, and the pulp or mesocarp is formed by the increase of the parenchyma or fleshy tissue of the leaf. There is much confusion in the cultivated species. The *griottes* of the French belong to *Cerasus caproniana*, DC.; the *bigarreaus* to *C. duracina*, DC.; the *Merisiers* or wild, to *C. avium*, DC.; the *guigniers* or *geans*, to *C. Juliana*, DC. Don¹ gives eleven sorts referred to *C. avium*, sixty-one to *C. duracina*, and thirty-eight to *C. Juliana*. In all, he names two hundred and twenty sorts. The London Horticultural Society in 1832 recognized two hundred and nineteen varieties. In 1866 Downing describes one hundred and thirty-two sorts, and in 1887, the American Pomological Society approves of forty-one kinds as deserving of culture. In the first century Pliny² speaks of the Apronianan as the reddest variety, the Lutatian as the blackest, the Cœcilian as perfectly round, the Junianian as agreeable, but very delicate and not bearing transportation, the Plinianan as the finest, the Lusitanian and those of the Rhine, besides several of doubtful interpretation. The Rhine cherry, he says, has a third color, being a mixture of black, red and green, and has the appearance of being just on the turn to ripening.

In the Geoponics,³ directions are given by Democritus for raising grapes without kernels, and he says the same method will produce seedless cherries. Martial, as quoted by Palladius⁴, avers the same. I find, however, very little on seedless cherries in later writers. Knight⁵ says he crossed the Morello and Common Cherry, and obtained five cherries from nearly as many thousand blossoms, and four of these did not contain seed. In the best varieties of the cherry, I have found many of the kernels to be abortive. thus:⁶

¹ Gard. Dict. Vol. 2, p. 505.

² Pliny, lib. xv. c. 30.

³ Geop. lib. 4, c. 7.

⁴ Pall. lib. 3. c. 29; lib. 11, c. 12.

⁵ Phys. and Hort. Papers, 277.

⁶ Rep. N. Y. Ag. Exp. Sta. 1882, p. 81.

<i>Variety.</i>	<i>Total Pits Examined.</i>	<i>Per Cent. Abortive.</i>
Black Tartarean.....	30.....	37
Elton.....	20.....	15
Governor Wood.....	30.....	50
Black Eagle.....	3.....	17
Burr's Seedling.....	30.....	93

In October, 1884, I had planted quite a large number of cherry pits. July 24, 1885, the following numbers were found vegetated :

<i>Variety.</i>	
Black Tartarean.....	3 per cent.
Elton.....	0 "
Black Eagle.....	22 "
Buttner's Yellow.....	19 "
Napolean Bigarreau.....	13 "
Yellow Spanish.....	4 "
Average.....	10

This limited data, supplemented by a large mass of unrecorded observation, leads me to believe that our improved varieties of the cherry are subject to partial sterility, which seems to be correlated with quality.

CITRON. CITRUS MEDICA, L. (RUTACÆ).

This is a large oblong or ovate fruit, the skin rough with protuberances, and of the well known citron color when ripe. There are very many varieties, some round, some oval, others oblate spherical, and others fingered. Very many fingered forms are figured by the early writers. It is a pulpy fruit with a spongy rind. It is supposed by many botanists that the citron, the orange, the lemon, and the lime, are all derived from this species¹. Brandis and Sir Joseph Hooker distinguished four cultivated varieties: *Citrus medica*, the Cedratier of the French, the Citron of the English, the Cedro of the Italians, called *Vijapura* in Sanscrit; *Citrus medica Limonum*, the Citrionnier of the French, the Lemon of the English; *Citrus medica acida* (*C. acida*, Roxb.), called in Sanscrit *Jambira*; *Citrus medica Limetta* (*C. Limetta* and *C. Lumia*, Risso), the Sweet Lime.²

The Chinese citron, the cedrat of Florence, and several others

¹ Lindley, Jour. of Hort. Soc., x. 171.

² DeCandolle, L'Orig. des. pl. cult. 1883, 142.

which resemble them, are sterile or nearly so; the Ponciere is always seedless; the large orange citron has a thin and acid pulp, and never contains seed.¹ The Troon or Tabernacle citron is so highly prized at Mogador by the faithful observers of Israelite traditions, that specimens without blemish are sold at a very high price. It is rather larger than a lemon, and is said to contain only one pip, to be of a very fine nature, and to keep sound for a very long period.²

CUCUMBER. CUCUMIS SATIVUS, L. (CUCURBITACEÆ).

This fruit consists of three carpels united together and forming one cell, but having the ovules arranged on three lines which pass up the sides. It has been planted in gardens from most ancient times, and often appears as an escape in suitable climates, and has been described under a number of specific names³. There are many varieties. Ibn-al-awam describes five in Spain in the twelfth century. Parkinson in England, in 1629, describes six; L'Horticulteur Francais, 1824, names seven kinds; Noisette, in 1829, names or describes ten sorts; the New York Agricultural Experiment Station Report for 1887 describes twenty-six varieties under one hundred and thirty-two synonyms.

In the Geoponics, lib. xii. c. 19, directions are given how to raise cucumbers without seed, so also by Palladius, and seedless cucumbers are mentioned by Ibn-al-awam, a Moorish-Spaniard of the twelfth century. Loudon⁴ says many persons prefer cucumbers which have not been fecundated, on account of the much smaller size of the seed integuments, which never contain kernels. These seedless cucumbers of the English Frame varieties frequently appear under forced culture in our greenhouses, and also when grown in the open air. In 1882 an advertisement of Sharpe's Epicurian Cucumber in the "Gardener's Chronicle," says it is "a variety that seldom produces seeds, not one in a hundred containing a trace." Large cucumbers of fine quality are usually little seedy. At the New York Agricultural Experiment Station in 1885, the following varieties contained but few seed as compared with the rest,

¹ Gallesio, Citrus Family, Fla. Agr. Trans. p. 16.

² Gard. Chron. Nov. 8, 1884, p. 601.

³ Cogniaux in DC., Monog. iii. 498.

⁴ Loudon, Hort. 1860, p. 495.

viz.: Vert long de Chine ; Turkey Long Green ; Peerless White Spine ; Perfect Pickling ; Large White Bonneville ; and Carter's Best of All. In 1882 the English Frame Cucumber, Giant of Armstadt, was the finest flavored of all varieties tested, but contained no fertile seed.¹ In the glass culture for our markets seedless cucumbers are frequently found, and as under the conditions that seedless fruits occur the vines set badly, it is often the custom for the growers to place a hive of bees within the glass-house so that these insects may further the act of fertilization.

CURRENT. RIBES RUBRUM, L. (SAXIFRAGÆ).

The berries are one-celled, and contain numerous seeds suspended in pulp by long threads. Thory² recognizes eight botanical varieties, the large-berried, the rosy-fruited, the white, the pearl, the variegated leaved, the white-nerved, the flowers in spikes, and the reddish. Duhamel³, in 1768, describes the large red, the flesh-colored, the white and the pearl. Forsyth⁴, in 1803, recognizes seven varieties ; Thomas⁵, in 1867, describes eighteen sorts, and Fuller⁶ twenty-six.

The number of seed to the berry varies considerably in the currant. In some countings⁷ the Cherry variety averaged 14.1 seed to a berry, but some extra large berries averaged 15.2 seed and one large bunch gave fruit with twenty seed. Some Red Dutch berries averaged 4.8 seed, and some White Dutch 9.8 seed. In some unreported observations, seedling plants were grown from seed taken from berries with few and many seeds. The plants from the very seedful fruits were larger, coarser and hardier than those grown from the few-seeding. The best fruit was found in the few-seeded, but not equal to the fruit of named varieties. The trial as regards correlation between seedlessness and quality was indecisive, yet full of suggestion. In the case of

1 Rept. N. Y. Ag. Ex. Sta. 1882, p. 126.

2 Monog. du genre Groseillier, 1829, p. 9.

3 Duhamel du Monceau, arb. fruit, 1768, i. 266.

4 Fruit Trees, Albany, 1803, p. 113.

5 American Fruit Culturist, 1867, 427.

6 Small Fruit Culturist, 1867, 203.

7 N. Y. Ag. Ex. Sta. Rept. 1882, p. 80.

the currant we have the largest berries containing the most seed, as is the case with the grape. In the same bunch berries may be found containing three to eighteen seeds.

CYCADS.

In Focke's work—*Die Pflanzen Mischlinge*—he states that female plants of Cycads often produce apparently perfect cones in greenhouses in Europe, yet their seed contains no embryo¹.

DATE. PHENIX DACTYLIFERA, L. (PALMÆ).

In the date the epicarp is the outer brownish skin, the pulpy matter is the mesocarp, and the paper-like lining is the endocarp covering the hard seed. This seed is composed of horny albumen with a groove down the front and the embryo placed at the back. The two sexes are borne on distinct trees, and the female tree is usually fertilized artificially. In India, Arabia, and elsewhere, this is done before the flower-spathes open, by boring a hole in the sheath of the female flowers and inserting therein a few bits of the male panicle². Theophrastus was acquainted with this method, and Pliny also had knowledge of the necessity.

The fruit of the wild date consists more of seed than of pulp, and altogether is only about one-fourth the size of the Arabian kind brought annually to Calcutta for sale³. On the oasis of Sirvah, four kinds were seen by St. John⁴, the Sultana, a long blue one; Farayah, white and said not to grow in Egypt; the Saidi, a common date; the Weddee, good only for camels and donkeys; also a very luscious yellow sort. Dr. James Richardson found no less than forty-six sorts cultivated in the oases of Northern Africa⁵. Those of Gomara, says Mueller⁶, are large and contain no seed. Seedless dates are mentioned by Theophrastus⁷, the third century before Christ, and by Pliny⁸ in the

¹ Gard. Chron. Apr. 14, 1883, p. 466.

² Stocks, Hooker's Journ. of Bot. vii. 551.

³ S. N. Robinson, Jour. Agric.-Hort. Soc., ix. quoted by Firminger, Gard. in Ind. p. 172.

⁴ Adventures in the Libyan Desert, p. 188.

⁵ Archer, Profit. plants, p. 31.

⁶ Mueller, Sel. Pl. p. 162.

⁷ Theop. De plant. Bodaeus a Stapel ed. 1644, 90, 102.

⁸ Pliny, lib. xiii, c. 7.

first century, who says small fruit without seed are often found on the same shoots with others. At Maesaba, in Palestine, there is a date palm in a convent courtyard, said to have been planted by St. Saba, A.D., 490, which always bears stoneless fruit¹, and at Mooltan, India, there is one tree which bears a stoneless fruit, and in former years it was considered a royal tree and the fruit was reserved for the reigning sovereign².

DIOSCOREA ACULEATA, L. (DIOSCOREACEÆ).

The fruit of this yam, eaten by the common people of Malabar, according to Rheede,³ has no seed.

DIOSPYROS MELANOXYLON, ROXB. (EBENACEÆ).

This species has an ovoid or globose yellow fruit, about an inch to an inch and a half in diameter, with yellow pulp, soft, sweet and slightly astringent. The seeds four to eight⁴. In India, Forsyth⁵ mentions a cultivated variety without stones.

DIOSPYROS SCHI'TSE, BUNGE. (EBENACEÆ).

This large orange-colored fruit of northern China, as sold in the streets of Peking, according to Bretschneider,⁶ is always aspermous.

FIG. *FICUS CARICA*, L. (URTICACEÆ).

This is an anthocarpous fruit, in which the axis or the extremity of the peduncle, is hollowed, so as to bear within numerous flowers, all of which are united in one mass to form the fruit. Dr. Presl⁷ enumerates no less than forty varieties that are cultivated in Sicily. Dr. Robert Hogg⁸ enumerates sixty-five. In the United States a leading firm of nurserymen⁹ offer twenty-five varieties in its list. The London Horticultural Society's Catalogue¹⁰ give forty-two varieties.

1 Gard. Chron. Jan. 23, 1886, p. 114.

2 Journ. Agri.-Hort. Soc. of Ind., 1867, Nov. 20.

3 Rheede, Malabar, vol. vii., p. 71.

4 Brandis, Forest Flora, p. 294.

5 Highlands of Central India, p. 463.

6 Bretschn. Bot. Sin. 111.

7 Hooker's Journ. of Bot. i. 142.

8 Fruit Manual, 3d ed. p. 102.

9 Ellwanger & Barry, Desc. Cat. 1880.

10 Downing, Fruit, 1866, p. 290.

The flowers of the wild fig are used for the caprification of the cultivated fig in various parts of the East. This process was known to the ancients¹.

The cultivated fig bears two sorts of fruit; in the spring early figs or *fiorones*, and in the summer late figs. In the *fiorones* male flowers are very rarely found, and the few that may be present cannot serve for fecundation, for they do not appear until long after the stigmata of the female flowers are dried and destroyed. "I have never been able," says Prof. Gasparrini² "to find seeds with embryos in the *fiorones*." The summer fruit, on the contrary, have no male flowers, and yet nearly all of their ovaries become perfect, that is, furnished with embryos. Many kinds of figs, says Brandis³, have sterile seed, that is, seed in which the embryo has not been developed, and therefore, fecundation is not an essential condition to the ripening of figs.

GOURD. *LAGENARIA VULGARIS*, SER. (*CUCURBITACEÆ*).

Directions for making the gourd seedless are given in the *Geoponics*, lib. xii. c. 19, and Ibn-al-awam, in the twelfth century, a Moorish-Spaniard, mentions seedless gourds. Since the appearance of the pumpkin and squash, at the discovery of America, the gourd has scarcely been grown in Europe for edible purposes, and hence has been but little under observation.

GRAPE. *VITIS* SP. (*VITACEÆ*).

The grape is botanically a berry, an indehiscent fruit which is fleshy or pulpy throughout. The seeds nestle in pulp formed from the placentas. The berry is formed from the ovaries alone. All the true grape vines bear fertile flowers on one stock, and sterile flowers on another separate stock, and are, therefore, called polygamous, or not quite correctly, diœcious. The sterile plants bear male flowers with abortive pistils, so that while they never produce fruit themselves, they may assist in fertilizing the others; the fertile flowers, however, are hermaphrodites, con-

¹ Diosc. lib. i. c. 184; Theoph. lib. i. c. 8; Arist. U. An. lib. v. c. 26. See also Walpole's Turkey, xxiii. 241, note. Pliny, lib. xv. c. 19 and lib. xvii. c. 27.

² Ann. des Sc. (III). t. 5, p. 306.

³ Forest Flora, p. 419.

taining both organs—stamens and pistils—and are capable of ripening fruit without the assistance of the male plant¹.

GRAPE. VITIS LABRUSCA, L.

In 1884 I saw bunches of the Wyoming grape which carried many seedless berries; the seedless grapes were small and ripe, with scarcely any toughness to the pulp, while the seeded berries were of the usual size and unripe. Professor Bailey² records an analagous example with a hybrid form. The larger part of the bunch bore fruit of the ordinary size, and the ordinary almost insipid flavor, but one bunch bore fruit about half as large, with thinner skin, an entirely different and better flavor and seedless.

On account of the uncertainty attending the classification of our cultivated varieties, I offer such notes as I possess under this heading. I am indebted to Professor E. S. Goff, of Madison, Wis., for assistance in this counting.

<i>Variety.</i>	<i>No. of Berries.</i>	<i>No. of Seed.</i>	<i>Av Seed per Berry.</i>
Vitis Labrusca, (Wild.)	521	1406	2.69
Vitis cordifolia, (Wild.)	75	191	2.54
Brighton, (Labrusca)	91	146	1.60
Catawba, (Labrusca)	385	825	2.14
Clinton, (Riparia)	184	280	1.52
Concord, (Labrusca)	719	1323	1.84
Delaware, (Lab. × Vinif. ?)	1311	1722	1.31
Iona, (Labrusca)	20	45	2.25
Isabella, (Labrusca)	55	88	1.60
Salem, (Lab. × Vinif.)	151	355	2.35
Vergennes, (Labrusca)	111	186	1.67

In a number of countings I have the material for arranging in another form: thus—

	<i>No. of Berries.</i>	<i>No. of Berries With</i>						
		0 Pips.	1 Pip.	2 Pips.	3 Pips.	4 Pips.	5 Pips.	6 Pips.
Vitis, Labrusca	521	0	84	138	172	112	8	7
Vitis cordifolia	75	0	13	25	20	17	0	0
Brighton,	91	2	46	31	10	2	0	0
Catawba,	355	0	85	158	99	13	0	0
Clinton,	184	0	89	89	6	0	0	0
Concord,	719	1	263	323	117	15	0	0
Delaware,	1311	5	934	329	42	1	0	0
Isabella,	25	0	14	10	1	0	0	0
Salem,	151	0	27	62	44	18	0	0
Vergennes,	111	3	49	41	17	1	0	0

¹ Engelmann, Bushberg Cat., 1883, p. 9.

² Bull. No. 31, Mich. Ag. Coll. 1887, 85.

In the case of these grapes, the largest berries have the most seed.

GRAPE. VITIS VINIFERA, L.

The Geoponics¹, as also Columella², gives directions for obtaining grapes without kernels, and Palladius³ mentions a beautiful sort without stones, and Pliny⁴ mentions the Rhætica, as possessing the thinnest skin of all the grapes and but a single stone. The description does not further suggest the Muscat of Alexandria grape, but specimens of raisins from these made in California, I found, in 1881, to contain but a single seed, with one other abortive remnant of a seed. In 1503-8, Ludovico de Varthema⁵ found at Reame, a city of Arabia Felix, a white grape, which had no seeds within, than which, he says, I never tasted better. Parkinson⁶, in 1629, says "the grape without stones is also a kind of it selfe, and groweth naturally neere Ascalon, as Brochard affirmeth, the wine whereof is redde, and of good taste."

The word "raysons of corannte" occurs in "The Forme of Cury" an English cook book compiled about A. D. 1390⁷, and is the first reference I find to the Corinth grape. Dalechamp⁸, in 1586, speaks of the *apurennoi*, that is, seedless, which are commonly called Corinth, and grow in the gardens of Italy and Piedmont. Modern authors describe the white and purple varieties of the Corinth grape as seedless, and this grape furnishes the "dried currants" of our kitchens. In California I am told that the Zante or Corinth grape so frequently seeds as to check the attempt to prepare this article of commerce, and that in Australia the same thing happens⁹. It would appear that this grape has been transmitted through cuttings for unknown centuries.

Among the grapes of Cabul is the "ungoor-i-Kishmishee" a fruit not large, round, transparent, seedless, sweet and luscious.

1 Geopon. lib. 4, c. 7.

2 Col. de arb. c. 9.

3 Pal. de re rust, Feb. c. 29.

4 Pliny, lib. xiv. c. 4.

5 Travels of. Hakl. Soc. ed. p. 77.

6 Parad. 1629, p. 564.

7 Warner, Antiq. Culin. 1791. The Forme of Cury, Receipt, 14, etc.

8 Dalechamp, hist. gen. 1586, p. 1406.

9 E. J. Wickson, San Francisco, Cal., in letter of Feb. 13, 1880.

In Bulkh, the sweetest and best wine grape is called Kishmish; it is black, oval, of good size and seedless¹. The white wine of Ispahan is made from a white grape called Kishmish, which has no pips². Niebuhr³ says the Arabians dry a small sort of grape called Kischmish which has no stone, but only soft and almost impalpable seeds. Pallas⁴ says in Astracan, the Kyshmish or the grape without stones ranks first and is esteemed the best kind.

The Sultana grape in California is seedless, as Mr. Wickson informs me, and in the graperies of the Department of Agriculture at Washington, Mr. Saunders tells me it is also seedless. Arnold⁵ speaks of the small stoneless grapes in Persia, which when dried, are sold as "Sultana" raisins, and praises their quality. The grapes of Eschol⁶ have generally a transparent membranous seed, though some are said to have no seed at all, and Le Bruyn describes similar grapes without seed in Persia. In the Punjaub they have an indigenous stoneless grape called the Bedana⁷.

The graperies of the late M. H. Simpson, of Saxonville, Mass., contains a seedless Black Hamburg vine, of which I have frequently eaten the fruit. The quality is exceptionally fine, but the berry is small. The brittle nature of the seed of our greenhouse grapes is familiar to all.

In counting the seeds of the *Vinifera* class of grapes, I have found:

Variety.	No. of Berries Examined.	No. of Berries with						Seeds to a Berry.	
		0 Pips.	1 Pip.	2 Pips.	3 Pips.	4 Pips.	5 Pips.		6 Pips.
Black Hamburg,	102	3	27	31	32	9	0	0	2.18
Morocco (Calif.)	126	3	83	32	5	3	0	0	1.38
Tokay, (Calif.)	268	13	83	100	46	21	4	1	1.97

GUAVA. *PSIDIUM GUAYAVA*, RADDI. (MYRTACEÆ).

In this fruit the seeds nestle in pulp formed by the placentas. The savory fruit, of the size of an apple, is highly relished in

1 J. Harlan. U. S. Pat. Off. Rept. 1861, 529, 534.

2 Redding quoted, U. S. Pat. Off. Rept. 1860, 367.

3 Travels through Arabia.

4 Travels, i. 313.

5 Arnold, Through Persia by Caravan, 151.

6 Calmet, Dict. of the Bible.

7 Firminger, Gard. in Ind. 212

many localities, and is eaten raw or made into a conserve. It is covered with a rind of some thickness, within which are the seeds contained in the pulp, without any shell. The contained pulp is of white, red or yellow color in the varieties, full of bony seeds, as Lunan remarks¹. Its cultivation has been carried on by the primitive inhabitants of the main land of America from Mexico to Brazil, from time immemorial, says Unger², and it is frequently without seed.

KAKI, OR JAPANESE PERSIMMON. DIOSPYROS KAKI.
(EBENACEÆ).

In California Mr. E. J. Wickson³ writes that some Japan persimmons bear seedless fruit the first year, but the second year seeds appear. In a southern paper⁴ the Zingi variety is stated to have buttery melting sweet flesh, and to be without trace of seed. C. C. Georgeson⁵, in 1887, figures and describes twelve sorts in Japan, one sort with seed is described as "best"; one with the fact of seedlessness or otherwise, or quality not noted; two with seed not noted, but quality best; one, seed not noted, quality very good; three seedless, quality *best*; three seedless and quality delicious; one seedless, quality very good. J. B. Berckmans⁶ figures and describes eleven varieties; of these one with seed is pronounced excellent; of two he gives no particulars; one, no statement regarding seed, but quality very sweet, and another with no mention of seed, quality good; of the seedless, one has no statement of quality, one is pronounced good, two are very sweet, one is excellent, and one is *best*. Mr. N. E. Vandeman⁷ seems to be able to separate but three varieties in this country as sufficiently well recognized out of the confusion of very many names. Of these the Hachiya has numerous seeds, the quality below that of some varieties; the Tane-nashi is seedless, and one of the choicest sorts; the Yemon is seedless, and the best in

¹ Hort. Jam. i. 350.

² U. S. Pat. Off. Rept. 1859, 349.

³ Letter dated Feb. 13, 1880.

⁴ Southern Enterprise, Dec. 1880, p. 72.

⁵ Orchard and Garden, Oct. 1887, Figures.

⁶ Rural New Yorker, Oct. 8, 1887.

⁷ U. S. Dept. Ag. Rept. 1887, p. 643.

quality. In Japan there are recognized some fifty varieties, thirteen of which Henry Loomis¹ pronounces as constituting the leading sort. Of these the Yemon has some specimens seedless, especially when the trees are young. The quality seems to be excellent, superior to many, but not equal to the Gosho.

LAUREL CHERRY. *PRUNUS LAUROCERASUS*, L. (ROSACEÆ).

Bauhin in his Pinax, 1623, speaks of the *Cerasus folio laurino* as commonly having a stone fruit, but that at Trebizond there is a stoneless form. This species, a native of Trebizond, is said by Baillon² to have been introduced to Europe in 1576, and is abundantly cultivated in England and France. Its leaves are used for aromatic flavoring in cookery.

LEMON. *CITRUS MEDICA*, VAR. *LIMONUM*, L. (RUTACEÆ).

The common lemon, says Galesio³, contains many seeds. It produces hybrids and varieties that have few seeds, and sometimes no seeds, and it is always in those deviating most from the types that we remark this sterility. The double flowered lemon is a tree whose flowers have many petals, but are not entirely sterile. It has no seeds. In California, Carey's Eureka variety bears fruit nearly seedless, the rind thin and sweet, the pulp very juicy⁴. In South Africa, Thunberg⁵ writes that he met with a lemon which contained another within it, furnished with a red rind, and that neither of these two lemons had any seed.

LIME. *CITRUS LIMETTA*, RISSO. (RUTACEÆ).

The lime of Naples, the fruit the smallest of European lemons, has a smooth, thin, odorous rind. Its pulp is abundant, its juice acid and agreeable because of its delicacy and aroma. It has no seeds, and as Galesio⁶ states, is one of the most highly esteemed lemons.

¹ Scientific Farmer 1879, p. 78.

² Baillon, Hist. of Plants, i. 441.

³ Treatise on the Citrus Family. Florida Ag. Trans. pp. 16, 23.

⁴ Carey, Lecture on Orange and Lemon Culture, p. 14.

⁵ Travels, ii. 141.

⁶ Galesio, Treatise on the Citrus Family, p. 24.

LOTOS. ZIZYPHUS LOTUS, DESF. (RHAMNEÆ).

Theophrastus¹ says the lotos without stones is the best. Pliny² says that the fruit which has no stone in the inside is the best. Decandolle identifies this lotos with *Zizyphus lotos*, Desfont. This fruit is of the size of sloes, containing large stones³, and is an important article of food in Tunis and Barbary. The Arabs are excessively fond of it, and Park in Africa describes the small farinaceous berries as of a delicious taste. Consult Sprengels Hist. Rei Herb. p. 22, 83 and 251.

LUCUMA BIFERA, MOL. (SAPOTACEÆ).

This Chilean tree, according to Molina⁴, bears fruit twice a year. The one set early in summer, have no kernels; the other set in autumn have two kernels. It is cultivated.

MALAY APPLE. EUGENIA MALACCENSIS, L. (MYRTACEÆ).

This tree is cultivated in the Indian Archipelago, the Pacific Islands, China, India, etc⁵. Firminger says the fruit is of the size and form of a very small apple, perfectly smooth, of a pure translucent white with a crimson blush, that some persons eat it, but that it is not worth the eating. Cook⁶ says the fruits at Batavia are pleasant and cooling, but not possessing much flavor. Seemann describes the flavor as delicate: Lindley says when well ripened, delicious. Louriero commends it in Cochin China. There are apple-shaped, quince-shaped and pear-shaped varieties mentioned. Bauhin in his Pinax, 1623, mentions a stoneless variety.

MANGO. MANGIFERA INDICA, L. (ANACARDIACEÆ).

Of this fruit there are numberless varieties, differing in color, form and savor as do the pears and apples of Europe, says Loureiro. In some of its varieties it is esteemed delicious. About

¹ Theop. Hist. pl. lib. iv. c. 4.

² Pliny, lib. xiii. c. 32.

³ Don. Gard. Dict.

⁴ Molina, Hist. nat. du Chili, Paris, 1789, p. 169.

⁵ Firminger, Gard. in India, 265.

⁶ Cook, Voy. i. 305.

A. D., 1300, Friar Jordanus¹ says it "is a fruit so sweet and delicious as it is impossible to utter in words." Acosta² says that a stoneless variety is found, which is especially grateful to the palate. Garcia ab Horto³ somewhat earlier records a variety called *Guzarateus* on account of its excellence, somewhat smaller than the common sorts, yet superior in savor and odor, and having a very small nut or stone. Rumphius⁴, in 1741, describes the best variety in Amboinia as having a small stone. The mango differs greatly in its varieties, and while some receive the highest encomium, others resemble in taste, as is commonly said, a mixture of tow and turpentine. In India it seems to occupy the place that apples do with us.

MANGOSTEEN. *GARCINIA MANGOSTANA*, L. (CLUSIACEÆ).

The first mangosteen which ripened in England was of the size of a St. Michaels orange. It was of a deep plum color, and upon being opened was found perfect in every respect except the formation of seeds, of which there was no trace. Its quality was delicious⁵. F. W. Burbridge⁶ says that in its wild state the interior of the fruit consists of four divisions only, all four containing each a perfect seed, whereas in the much larger cultivated fruits there are seven or eight divisions, and of these rarely more than one contains a perfect seed. Rumphius⁷ says that some segments in the cultivated fruit are often seedless, and that frequently some fruit contain no fertile seed.

This fruit is deemed by many the most delicious fruit of the world. Bayard Taylor thus describes it: "Beautiful to sight, smell and taste, it hangs among its glossy leaves, the prince of fruits. Cut through the shaded green and purple of the rind, and lift the upper half of it as if it were the cover of a dish, and the pulp of half-transparent, creamy whiteness stands in segments like an orange, but rimmed with darkest crimson where the rind

¹ Marvels described by Friar Jordanus. Hakl. Soc. ed. p. 14.

² Acosta. Aromaticum, 1582, p. 70.

³ Aromaticum, 1567, 217.

⁴ Amb. 1741, i. 94.

⁵ Gard. Chron. 1855, p. 259.

⁶ Gard. Chron., Jan. 5, 1884, p. 23.

⁷ Amb. i. 132.

was cut. It looks too beautiful to eat; but how the rarest sweetest essence of the tropics seem to dwell in it as it melts to your delighted taste."

MEDLAR. *MESPILUS GERMANICA*, L. (ROSACEÆ).

Duhamel¹ describes and figures a medlar without seeds, and says it is preferred as being more delicate and of a softer texture than the common kind. Noisette² speaks of it as a singular fruit, but small and of mediocre quality. Don³ mentions the stoneless medlar as bearing a small fruit of little merit, and Loudon⁴ gives the same description. In 1880 a French nursery catalogue advertises a variety of medlar under the name of "Stoneless."⁵

MELON. *CUCUMIS MELO*, L. (CUCURBITACEÆ).

Melons of the highest quality contain fewer seed than do varieties of medium or inferior quality, as I have often observed. This even seems to hold true as between individual fruits of the same variety to a marked extent. Cæsalpinus, in 1538, notes that melons with small seed are the best for eating. In four varieties selected for their high quality, the following particulars were obtained.

<i>Variety.</i>	<i>No. of Spec.</i>	<i>Av. No. of Seed.</i>	<i>Av. Wt. of Seed Grs.</i>	<i>Av. Wt. of Fruit Grs.</i>	<i>Pcr Cent. of Seed.</i>
Christiana,	3	512	234	18,621	1.25
Hackensack,	1	550	273	29,181	.93
New Surprise,	3	530	231	12,443	1.85
Shaw's Golden Superb,	1	494	203	12,632	1.60

MULBERRY. *MORUS ALBA*, L. AND VAR. *NIGRA*, L.
(URTICACEÆ).

The edible portion of the mulberry is formed by the cohesion into a single mass, of the floral envelopes and ovaries of a large number of flowers arranged on a central fleshy column or spike, the calyces becoming succulent, and investing the pericarps. In

¹ Duhamel du Monceau, arb. fruit. 1768, i. 331.

² Noisette, Man. du Jard. 1829, 439.

³ Don. Gard. dict. 1832, ii. 605.

⁴ Loudon, Hort. 552.

⁵ Transon Bros. Orleans, France. Cat. of 1880-1.

Asiatic countries the fruit is held in esteem. In Kashmere and Afghanistan, says Brandis¹, there are varieties sweet and acid, of all shades of color from a white to a deep blackish purple. Downing² describes one cultivated variety of *M. rubra*, one of the *M. nigra*, and one the Everbearing, derived from *M. multi-caulis*. The fruit of several other species are, however, valued in the Orient.

Forskal³ notes about Constantinople the cultivated mulberry as having a succulent pulp and few seeds. Brandis⁴ quotes Stocks that in Beloochistan there is a seedless variety called *Bedana*. Schuyler⁵ says that in Turkistan the Khorasmi mulberry from Khiva, large white, almost seedless, is greatly used for food both when fresh and dried. Harlan⁶ says that in the markets of Cabul, the white-seeded mulberry or Shah-toot, the thickness of the small finger, is very sweet, and in its season forms the chief food of the poor. It is a grafted fruit.

MYRTLE. MYRTUS COMMUNIS, L. (MYRTACEÆ).

The fruit of the myrtle is eaten by the modern as it was by the ancient Athenians⁷. It is, however, of little prominence in the cookery of even southern nations. Camerarius⁸ speaks of a tree that produced fruit without seed.

OLIVE. OLEA EUROPÆA. (OLEACEÆ).

The recent prominence given to olive culture in California, has brought to view some facts concerning the correlations of seedlessness with quality. The following is taken from the bulletin of Feb. 15th, 1890, from the University of California Agricultural Experiment Station, (No. 85).

¹ Forest Flora, 407.

² Fruits, 1866, p. 347.

³ Forskal, fl. Aeg. Arab. 1775, p. xxxiii.

⁴ Brandis, Forest Flora, p. 408.

⁵ Schuyler, Turkistan, i. 196.

⁶ J. Harlan, U. S. Pat. Off. Rept. 1861, 529.

⁷ Hogg, Jour. of Bot. i. 117.

⁸ Camerarius, Hort. med. 1588, 95.

Dimensions in 16ths of an inch.

<i>Variety of Olive.</i>	<i>Whole fruit.</i>		<i>Pit.</i>		<i>Pit per cent. by bulk.</i>
	<i>Length.</i>	<i>Width.</i>	<i>Length.</i>	<i>Width.</i>	
Regalis,	17	13	9	5	7.8
Manzanillo No. 1,	16	13	9	5	8.3
Nevadillo Blanco,	16	10	10	4	10.0
Pendulina,	12	9	7	4	11.5
Columella,	14	11	8	5	11.8
Mission,	16	10	10	5	15.6
Polymorpha,	19	12	12	6	15.8
Rubra,	12	8	8	4	16.7
Rock's Oblonga,	15	8	11	4	18.3
Redding Picholine,	8	6	6	4	33.3
Uvaria,	13	9	10	6	34.2

ONION. ALLIUM CEPA, L. (LILIACEÆ).

The top-onion may be mentioned as a plant not bearing seeds, yet I have often observed a few seeds arising from among the bulbs. In one case an onion of the ordinary sort became injured in the stalk. From the split a cluster of bulbs protruded, and the "top" failed to produce seed.

OPUNTIA. (CACTEÆ).

Opuntia Davisii, Engelm., is common on the Upper Canadian, near the Llano Estacado, Tex. All the fruits observed were sterile, and most of them elongated, one to one and a quarter inches long, as Engelmann states¹. In Sicily a variety of *Opuntia Ficus-indica* has fruits without seeds².

ORANGE. CITRUS AURANTIUM, L. (RUTACEÆ).

This fruit is botanically a hesperidium, or a berry with a leathery rind. It consists of the carpels surrounded by the external coat of the ovarium, and having the space between their inner wall and the seeds they contain filled with a very succulent

¹ Engelmann, Pac. R. R. Report, iv. 49, Fig. pl. xvi.

² P. L. S., Gard. Chron. Aug. 9, 1884, p. 171.

cellular tissue. The rind consists of epicarp and mesocarp, while the endocarp forms partitions in the interior filled with pulpy cells which are produced from the inner lining of the pericarp. There are many varieties. In Sicily¹ fourteen kinds are recognized; Loudon² mentions nineteen; Downing³ twelve; Gallesio describes forty of the principal kinds cultivated in Italy. The varieties named in Florida and California are very numerous, and some as the mandarin and tangerin have been described as species.

Gallesio asserts that in cross-breeding oranges, often monstrous fruits were produced, which included "little pulp, and had no seeds or imperfect seeds." Darwin,⁴ in commenting upon this, states that a myrtle-leaved orange in his father's greenhouse, during many years rarely yielded any seed, but at last produced one; and the tree thus raised was identical with the parent form. D. J. Browne⁵ speaks of the varieties of orange, some with a navel-like protuberance with no seeds. This appears to be the the Navel or Bahia variety, which in the State of California is perfectly seedless⁶, as also in Florida, as I have myself observed. Mr. H. E. Vandeman⁷ speaks of the variety as being almost entirely seedless. Another seedless orange in California is Garey's Mediterranean Sweet; it is of large size, excellent flavor, very delicate texture, and the larger number are entirely seedless⁸. A Japanese orange, the *Mushin Tane Nashi Mikaw* is said⁹ to bear a seedless fruit on a thornless tree. The St. Michael orange is also of the seedless kind. Dr. Balfour¹⁰ states that the thinness of the rind and its freedom from pips depend on the age of the tree. The young trees when in full vigor bear fruit with a thick

1 Hogg, Hooker's Jour. of Bot. i. 106.

2 Hort. p. 608.

3 Fruits, 1860, p. 691.

4 Darwin, An. and Pl., i. 405.

5 U. S. Pat. Of. Rept. 1858, 266.

6 E. J. Wickson, Ed. of Pac. Rural Press, in letter of Feb. 13, 1880.

7 U. S. Dept. Ag. Rept. 1887, 641.

8 Pacific Rural Press, Aug. 1877.

9 South Cal. Hort. Jour. 1878, p. 292.

10 Balfour's Botany, p. 280.

pulpy rind and abundance of seed, but as the vigor of the tree declines, the peel becomes thinner and the seeds gradually diminish in number till they disappear altogether. Browne¹ says the St. Michael orange, one of the most delicious of all varieties, is known by its small seedless fruit. Loudon² says this variety is generally without seed and Downing³ says the pulp is often seedless, juicy and lusciously sweet.

Seedless oranges were known several centuries ago. Bauhin⁴, in 1623, refers to the "*malus aurantia major* * * * *alia absque semine sunt*," and Ferrarius⁵, in 1646, describes and figures a seedless orange as does also Aldrovandus in 1668. The Navel or Bahia, with synonyms Washington Navel and Riverside Navel, certainly ranks as the most delicious sort. In a wild orange grove near Matanzas Inlet, Florida, in 1869, I found one wild orange tree bearing fruit with a sweet pulp and bitter rind; this contained fewer seed than did the bitter oranges adjoining.

In counting the seed of some oranges in 1881 and 1882, the varieties were sorted according to quality before the counting was concluded. The following figures were obtained:

	<i>No. of Spec.</i>	<i>Av. No. Good Seed.</i>	<i>Av. No. Abortive Seed.</i>	<i>Wt. of Seed Grs.</i>
Florida Orange, tender	5	6.2	0.8	18.6
" tough	2	11.0	1.5	47.7
Valencia Orange, tender	15	8.8	1.6	29.8
" " tough	10	12.8	1.5	40.0
Messina Orange, good	1	4.	2.	19.

OTAHEITE APPLE. SPONDIAS DULCIS, FORST.

(ANACARDIACEÆ).

The Otaheite apple, says Forster⁶, which contains a hard cap-

¹ Trees of Am., 59.

² Hort. p. 608.

³ Fruits, p. 694.

⁴ Bauhin, Pinax, 1623, 436.

⁵ Hesperides, 1646, lib. 4, c. 4, p. 383. Aldrovandus, Dend. 1668. 488.

⁶ Forster, obs. p. 179.

sule, commonly has no seeds in the locuments or divisions. Ellis¹, however, says it has a hard and spiked core, containing a number of seed. He calls it an excellent fruit. Forster in his *De Plantis Esculentis* says the seeds are solitary, ovate, compressed, usually abortive, thus recognizing both states of seeding and seedless. Firminger² says he is told that in India the stones never germinate, but young plants are usually obtained by grafting upon seedlings of *Spondias mangifera*, another species.

PEACH. *AMYGDALUS PERSICA*, L. (ROSACEÆ).

It seems to be a general rule that the sweetest, honiest peaches have usually a split stone. Africanus in the *Geoponics*³, give directions how to raise the peach without stones.

PEACH PALM. *GULIELMA SPECIOSA*, MART. (PALMÆ).

The peach palm, says Humboldt⁴, bears a fruit which is generally devoid of seed, owing to the extreme luxuriance of the vegetation. He⁵ also says that the *piritu* or *pirijao* palm bears clusters containing from fifty to eighty fruit, yellow like apples, and purpling as they ripen, two or three inches thick, and generally, from abortion without a kernel. Seemann⁶ says in most instances the seed is abortive, the whole fruit being a farinaceous mass. Occasionally, however, fruit are found containing the perfect stony seed, and they are then double the usual size. The tree is not found wild in the Amazon districts, but is invariably planted. Bates⁷ says bunches of sterile or seedless plants sometimes occur at Ega and at Para. It is one of the principal articles of food at Ega while in season, and is boiled and eaten with treacle and salt. Prestoe⁸ says the tree is extremely prolific, bearing two distinct crops a year, and sometimes more. At one season all seedless fruit are produced, and with a greatly enlarged fruit pulp, while at the other season only seeded or fertile fruits are produced. The

¹ Ellis, *Polynesian Researches*, i. 374.

² *Gard. in India*, p. 234.

³ *Geop. lib. x. c. 16.*

⁴ *Views of Nature*, p. 161.

⁵ Humboldt, *Trav. ii. 336.*

⁶ *Popular Hist. of Palms*, p. 208.

⁷ *A Naturalist on the Amazon*, p. 268.

⁸ *Rept. of the Bot. Garden of Trinidad, 1880, 39.*

seedless fruits are highly appreciated by all classes, both unripe as well as ripe.

PEAR. *PYRUS COMMUNIS*, L. (ROSACEÆ).

This fruit is botanically a pome, a fleshy fruit with the calyx adherent, and forming along with the epicarp or skin and the mesocarp or pulp, a thick cellular mass which is eatable, while the endocarp is scaly or horny, and forms separate cells enclosing the seeds. Its varieties are exceedingly numerous. Pliny¹ enumerates forty-two kinds as known to the Romans, and Columella² names eighteen sorts. Macrobius³, as quoted by Gesner, also furnishes a list, from which Gesner⁴ quotes with other Roman authors as furnishing twenty praiseworthy varieties. In Tuscany, in the times of the Medici there were catalogued two hundred and thirty-two kinds⁵; *Le Jardinier Solitaire*, 1612, describes fifty-five varieties in France; Meager, in his *English Gardener*, 1683, gives a list of one hundred and five; Knoop, in his *Pomologia*, 1760-6, figures one hundred and eighty-four kinds in color; Mawe, in his *Gardeners' Dictionary* of 1748, enumerates ninety-five; Don, in his *Gardeners' or Botanists' Dictionary*, 1832, gives a classified list of six hundred and seventy-seven sorts; Field, in his *Fruit Culture*, 1886, offers a catalogue of eight hundred and fifty varieties, of which six hundred and eighty-three are of foreign and one hundred and sixty-seven of American origin.

The more delicate varieties of pears, such as the Gansel's Bergamot and the Chaumontelle, says Lindley⁶, have rarely any seeds. On the other hand, R. Manning, deservedly a high authority on pears, tells me that certain varieties, such as Vicar of Wakefield and Beurre Diel have most of the seeds abortive, and the first named is not a delicate pear. The coreless pear⁷ is frequently destitute of seeds, but always contains the cells. The flesh is apt to decay at the core. It is a good bearer, but the fruit is ex-

1 Pliny, lib. xv. c. 16.

2 Col. de re rust. lib. v. c. 10.

3 Saturnalia, 2. 15.

4 Gesner. *Lexicon Rusticum*, 1788.

5 Targioni-Tozzetti, *Hort. Trans.* 1854, 159.

6 Lindley. *Theory of Hort.*, 1859, p. 170.

7 *Gard. Chron.* 1843, 737.

tremely liable to be shaken down by the wind; a very fine baking pear. Another account¹ states that many varieties occasionally are devoid of seed, but Belle de Bruxelles or the Poire sans Pepins is always so. An account is also given of a Chaumontel pear which bears seedless crops.

Second crop pears are invariably seedless, says R. Manning. I have always found them so whenever I have had opportunity for examination. An instance is given² of second blooming bearing double flowers, and I have observed the same in the case of strawberries in autumn bloom. On February 17, 1880, N. Plumadore, of Raleigh, N. C., writes me that some third crop pears were entirely seedless, having nothing but a small stem-like thread clear through the pear. The Paires sans pierre was mentioned by Estienne³ in 1570. The Bessemiawka, a Russian fruit of recent introduction, is nearly or quite seedless⁴.

I have counted the seeds in but a few pears. The figures follow:

<i>Variety.</i>	<i>Number of Specimens.</i>	<i>Av. Wt. of Fruit, Ozs.</i>	<i>Av. Wt. of Seed, Grs.</i>	<i>Av. No. Plump Seed.</i>	<i>Av. No. Total Seed.</i>
Buffum,	5	2.9	6.17	6.2	10.0
Flemish Beauty,	1	5.5	7.71	4.0	6.0
Nowell,	1	3.7	3.39	4.0	9.0
Sickle,	5	1.5	5.2	4.8	9.2

PEPPERS. CAPSICUM, SP. (SOLANACEÆ).

The most acrid peppers are crowded with seed. Sweet peppers as a class contain but few seed. Such are also subject to develop a berry or berries within the berry, these enclosed fruit either containing a few seed or entirely seedless. In some varieties, as the yellow Nocera and Spanish Monstrous, seedless specimens are of not unusual occurrence.

PERSIMMON. DIOSPYROS VIRGINIANA, L. (EBENACEÆ).

I have frequently been told of seedless persimmons. Mr. Saunders, Superintendent of the garden at the Department of Agriculture, informs me that he has frequently seen such. Mee-

¹ Gard. Chron. Oct. 17, 1885, p. 491.

² Gard. Chron. 1866, p. 901.

³ Estienne. L'Agric. Maison Rustique, 1570, 133.

⁴ Budd. in Iowa Ex. Sta. Bull. Nov. 1888, p. 72.

han mentions such in the Botanical Gazette for March, 1885, I think. J. M. Pearson¹ writes, "I have seen some of our native kinds without any seeds, of which the fruit was delicious."

PINEAPPLE. ANANASSA SATIVA. (BROMELIACEÆ).

This is a multiple fruit, only the ovaries or pericarps never or seldom ripen any seeds, but all are blended with the floral envelopes, the bracts, and the axis of the stem they thickly cover, into one fleshy and juicy mass. There are many varieties. In 1768 Taylor described five sorts; in 1737 Miller described five; in 1769 Speechley spoke of fourteen; in 1822 Miller of ten; in 1831 George Lindley of thirty-seven; in 1834 Rogers of nine; Mr. Munroe, a more recent writer, of fifty-two². In the Transactions of the Horticultural Society of London, fifty-two sorts are described. The greater number have been introduced into England from abroad, but several have originated from seed in England³.

This is a typical seedless fruit, none, as Lindley⁴ says, except the Enville now and then, having seeds, and this variety, though a large one, is of little value for its delicacy. Pineapples are more frequently seedful under the bad cultivation of the Continent than in the highly kept and skillfully managed pineries of England. New varieties are produced from seed, as was the case with the King pine⁵, which was raised from a seed taken from a West Indian fruit. Schomburgk⁶ says the wild pineapple in Guiana is small, yellow, aromatic, stringy and full of seeds, rather acidulous in taste. Piso⁷ describes a wild *ananas* containing seeds. Humboldt⁸ found pineapples of delicious quality growing wild in the Orinoco, and often the seeds were not abortive. Wild pineapples are mentioned by many observers, but nothing is said

¹ Ill. Hort. Soc. Trans. 1878, 89.

² McIntosh, Book of the Garden.

³ Hort. Trans. 2d ser. i. p. i.

⁴ Theory of Hort., 1859, 170, 171.

⁵ M'Intosh, Book of the Garden, II. 642.

⁶ Rawleigh's Disc. of Guian. Hakl. Soc. ed. p. 74, note.

⁷ Piso, Bras. 1658, p. 196.

⁸ De Cand, Geog. bot. p. 926, quoted.

about seed in those references we have consulted¹. A white kind which in the East Indies has run wild, is said by Unger² to still contain seeds in its fruit. Hughes³ in the Barbadoes mentions the seed as being very small and almost kidney-shaped, as if he had seen them. Rumphius notes a semi-wild pineapple in Amboina, bearing seeds, austere and rarely eaten. Arruda in Brazil speaks of a pineapple with small seeds, for the most part abortive⁴.

PISTACIA. PISTACIA VERA, L. (ANACARDIACEÆ).

The pistacia, says J. Harlan⁵, in his Fruits of Cabul, yields a crop of fruit one year, followed always by a crop of blighted fruit. The latter is like the former in external appearance, but is somewhat larger and quite destitute of kernel.

PLUM. PRUNUS DOMESTICA, L. (ROSACEÆ).

A stoneless variety of the plum is described by Duhamel⁶ and by Downing⁷, who says the fruit is small, the flesh greenish, harsh, acid, and the kernel without any stone surrounding. As Darwin says⁸, the kernel lies in a rough cavity surrounded only by the pulp.

In the richest, sweetest large plums, it cannot have escaped observation, that we have often the splitting of the stone within the fruit, as in the peach.

Prunus Americana, Marsh., is subject in New Brunswick to an anomalous form, which render it seedless and inedible⁹. I have observed this occurrence in Maine, the seed swollen, pulpless, seedless and tasteless. Sometimes the remnant of an embryo is to be found. This monstrosity seems more often to occur when the spring season is cold and rainy¹⁰, and is perhaps due to a fungus attack.

1 Montiero, Angola, p. 101. Afzelius (for Sierra Leone) quoted by Sabine. Hort. Trans. v. 461. Titford (Jamaica), Hort. Bot. Am. p. 54.

2 U. S. Pat. Off. Rept. 1889, 331.

3 Hughes, Barb. 1750, p. 230.

4 Roem-et Schult. 7, 1284.

5 U. S. Pat. Off. Rept. 1861, 533, notes.

6 Duhamel du Monceau, arb. fruit, 1768, ii. 110.

7 Downing, Fruit, 1885, p. 949.

8 An. and Pl. i. 417.

9 Hooker's Journ. of Bot. iii. 99.

10 See Dr. Harris in Hovey's Mag., viii. 247.

An examination of a few samples of plums gave the following figures :

<i>Variety.</i>	<i>No. Samples.</i>	<i>Av. Wt. Fruit Grs.</i>	<i>Av. Wt. Seed Grs.</i>	<i>Per Cent. Wt. of Seed to Fruit.</i>
Smith's Orleans,	10	736.0	18.2	2.47
Jefferson,	10	348.4	8.5	2.44
Frost Gage,	8	245.3	8.6	3.50
Suisse,	10	439.0	13.4	3.05
Fellenberg,	10	383.5	17.0	4.43
Golden Gage,	10	379.6	13.9	3.66
Bingham,	10	511.8	25.1	4.90
Blecker's Gage,	10	279.3	13.9	4.98
Hudson's Gage,	10	254.9	13.1	5.13
Pond's Seedling,	10	517.7	19.0	3.67

POMEGRANATE. *PUNICA GRANATUM*, L. (LYTHRARIÆ).

This is a peculiar baccate many-celled fruit, having a tough rind formed by the calyx, enclosing two rows of carpels placed above each other. The seeds are immersed in pulp, and are attached irregularly to the parieties, base and center. This pulp is apparently formed by the placentas. It is a fruit in much esteem in many localities in the Orient. Ibn-al-awam¹, a Moorish-Spaniard of the twelfth century, describes eleven varieties.

The pomegranate, with the ancients, was a mystical fruit, on account of the profusion of its seeds, typifying procreation, increase and abundance. There are many varieties. Capt. Burton² describes three in Arabia. The *Shami*, almost stoneless, and an exceedingly fine fruit; the *Turki* and the *Misri*, from the context seeding, and not of as fine quality. Barnes³ says Kaja is famed for its pomegranates without seed, although by far the finest are brought from villages half way up the mountains. The tree only grows in a few Afghan villages. Harlan⁴ enumerates the seedless pomegranates from Jillalabod among the fruits in the markets of Cabul. Barnes⁵, in his Travels in Bokhara, remarks on the pomegranate seeding in Magenderan as a remarkable peculiarity. In India, the best fruits, having sweet juice and very

¹ Le Livre de l'Agric., d' Ibn-al-awam, 1864, i. 252.

² Pilgrimage to El Medina and Mecca, i. 388.

³ Cabul, 1842.

⁴ J. Harlan, U. S. Pat. Off. Rept. 1861, 530.

⁵ Darwin, An. and Pl. ii. 205, note.

small seeds, come from Cabul¹. Hasselquist² observes the inhabitants of Cyprus called a variety having a small stem and barren flowers *Balaustia*. In 1860 cuttings from a seedless variety from Palestine, described as bearing fruit much esteemed in Syria, were distributed from the United States Patent Office³.

This seedless fruit was mentioned also by the ancients. Pliny⁴ says the sweet pomegranates known by the name of *apyrena* are generally considered to be injurious to the stomach. He further describes this *apyrena* as being seedless, of a whiter color than the others, and of a more agreeable flavor. In the Geoponics⁵ Africanus gives directions how to raise pomegranates that shall be seedless, and so also does Palladius⁶ and Columella⁷ from hearsay.

POMELO. CITRUS DECUMANA, L. (RUTACEÆ.)

A seedless variety of the Pomelo is said to be grown in Florida, as Mr. Vandeman informs me.

PUMPKIN. CUCURBITA, SP. (CUCURBITACEÆ.)

According to the experience of Ch. Naudin, when the *Cucurbita maxima*, *C. Pepo* and *C. moschata* are crossed, no seed or only sterile seed are produced⁸. I have also observed that the finer quality squashes and *C. moschata* pumpkins contain fewer seed than those of inferior quality. In the Barbadoes⁹ there are mentioned by Hughes four kinds, the white, the blue, the marbled and the garden pumpkin. "The latter differs from all the rest by having no seed; but is propagated by slips."

RASPBERRY. RUBUS, SP. (ROSACEÆ.)

In some observations made on the number of seed¹⁰ to a berry, the *Davidson's Thornless* averaged 34.2; the *Caroline* 47; the

1 Dutt. Hindw. Mat. Med. 166.

2 Voy. and Trav. in the Levant, 1766, p. 247.

3 U. S. Pat. Off. Rept., 1860, 34.

4 Pliny, lib. xxiii. c. 57; lib. xiii. c. 34.

5 Geoponics, lib. 4. c. 7; lib. 10, c. 31.

6 Pall. lib. 3, c. 29.

7 Col. lib. v. c. 10; also Col. arb. c. 23.

8 Darwin, An. and Pl. i. 430.

9 Hughes, Barb. 1750, p. 137.

10 N. Y. Ag. Ex. Sta. Rept. 1882, p. 80.

Clarke 57.6 seed to a berry. In some reported trials¹ the seedlings from few-berried fruits gave distinctly better quality but smaller size fruit than corresponding seedlings from many-seeded berries. The trials were with *Rubus occidentalis* varieties.

RIBES ALPINUM, L. (SAXIFRAGACEÆ).

Thory says he has often found seedless berries upon whole branches of fruit of this species².

SAPPODILLA PLUM. ACHRAS SAPOTA, L. (SAPOTACEÆ).

The medlar-like fruit of the Sappodilla plum, of a milky, quince-like taste, is much esteemed in tropical America and India. It has usually from six to twelve cells with several seeds in each, but Swartz³ remarks that most of the seed are usually lost by cultivation:

SERVICE. PYRUS LANUGINOSA, DC. (ROSACEÆ).

The flowers and fruit of this tree resemble those of the mountain ash, but are smaller, the flowers are frequently abortive, and the fruit, when it is produced, is generally without seeds.

STRAWBERRY. FRAGARIA, SP. (ROSACEÆ).

In this fruit the enlarged and conical receptacle bearing the pistils on its surface, becomes the edible portion in fruit. The varieties are endless, and the various classes have been referred to different species. Merrick,⁵ in 1870 catalogues eight hundred and thirteen kinds. The name *Strawberry* refers to the running stems strewed (anciently *strawed*) over the ground. This reminds us of Virgil's description " * * humi nascentia fragra." Servius Grammaticus, A.D., 412, calls them "fructus terra et mora terrestria," the equivalent of which is found in the Swedish and Danish name of *jordbar*, earth berry. Pliny's name was also *terrestris fraga*, ground berry. The earliest picture of the strawberry that I possess is in Herbarius cum Herbarium, Mogwntiæ, 1484, chap. lxiii., which is evidently of *Fragaria vesca*, as

¹ N. Y. Ag. Ex. Sta. Rept. 1885, 257. See also ib. 1855, 257.

² Thory. Grosseilier, 20.

³ Miller's Dict., Ed. of 1807.

⁴ Loudon, Arb. p. 924.

⁵ Strawberry Cultur. 1870.

the fruit is borne above the leaves. The figure is a rude one, but recognizable.

A mule plant from the Hautbois and Alpine strawberry, says Knight¹, blossoms very freely and its blossoms set well; but the growth of the fruit subsequently remains very nearly stationary during the whole period in which the Hautbois strawberry grows and ripens; after which it swells and acquires maturity. It is then rich and high flavored, but of less size than the Hautbois, and without seeds. Duchesne² remarks upon the sterility of the Breslinge, known in France under the name of *Coucou*. It is not completely sterile, however, but has produced a strawberry of fine flavor, the *Fraises mignones*. Mr. Saunders of the Department of Agriculture at Washington, told me February 16th, 1880, that he once had a bed of pistillate strawberries which fruited but bore no seed; the quality was fine. In my own trials I have found that the most superior varieties have contained fewer seeds to the berry than other varieties of inferior quality.

In some countings of seed³, fine specimens averaged seed to a berry as follows: Hervey Davis, 115; Triumph de Gand, 152; Monarch of the West, 232; Sharpless, 239. This corresponds in order very closely to the quality. Small, inferior samples of Wilson's Albany, however, had but seventy-two seed to a berry.

TOMATO. LYCOPERSICUM ESCULENTUM, MILL. (SOLANACEÆ).

It is a matter of common observation that the finest quality tomato fruit contains fewer seed than do those of inferior varieties. Burr⁴ also says there is a seedless variety, smooth and handsome, with few seeds.

A fair sample of four varieties gave seed as follows:

<i>Variety.</i>	<i>Wt. of Fruit Grs.</i>	<i>Seed to a Berry.</i>	<i>Wt. of Seed Grs.</i>	<i>Per cent. Seed to Berry.</i>
Mayflower,	1419	244	6.5	.38
Paragon,	3834	531	21.6	.56
Trophy,	3208	476	22.6	.70
Early Acme,	3449	491	24.7	.71

¹ Knight, Phys. and Hort. Papers, p. 276.

² In Lam. Enc. Meth. 1786, ii. 535.

³ N. Y. Agric. Ex. Sta. Rept. 1882, p. 80.

⁴ Garden Vegetables, p. 208.

WATERMELON. CITRULLUS VULGARIS, SCHRAD.
(CUCURBITACEÆ).

The watermelon was observed by Caesalpinus¹ in 1583, in a seedless state, and this is quoted by Bauhin in 1596 and 1623, as also by J. Bauhin in 1651. I find no other recorded instance.

In the above list of sixty-one species, we find quality either stated or inferred, in varying degrees, in the case of thirty-three; in the remaining twenty-eight either no, or insufficient, mention. It is more than probable that in every case of high development, for thus we class horticultural selections, the seed is changed in some respect from the seed of the wild type, either recognizable in reduction of number, size, weight or fragility. In many instances, such as the melon and tomato, the orange and the peach, and many others, this is effected through correlations, the horticulturist indifferent to the seed, but keen for the quality of juiciness, tenderness and flavor. It seems a legitimate field for horticultural effort, to experiment with seed from nearly seedless forms, or with seed which is more fragile or seemingly imperfect, in the endeavor to produce increased quality, as also with seed from unripe fruit.

¹ Caesalpinus, lib. 5, c. 5, p. 200.